

The brain-dead donor: An anaesthesiologist's perspective

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ABSTRACT

The brain-dead organ donation programme is slowly gathering momentum in India. There is a long way to go before our cadaver donor numbers, currently at 0.35 per million reaches 35 per million as is the case in countries like Spain. Each donor, therefore, has to be managed immaculately. The anaesthesiologists will be well served by familiarising themselves with the challenges during the crucial period preceding and during the actual harvest of organs in a brain-dead donor. There are significant opportunities for anaesthesiologists to make great contributions in this cause due to their unique skill sets and perspective. A robust brain-dead cadaver programme will go a long way in saving numerous lives as well as reduce the requirements of the living donor programme. A well-managed harvest will ensure good quality organs and an overall superior outcome in the recipients.

Key words: Anaesthesiologist, brain dead organ donor, organ harvest

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'The friend of him that ails is the physician and the friend of him about to die is charity'-Yudhishtra (Yaksha-Yudhishtra Samvada, Aranyaka parva Adhyaya-The Mahabharata)

INTRODUCTION

Organ donation in brain-dead donors (BDDs) is the final step in a long process that begins with the incident leading to the individual's death followed by the grief period, counselling, the conduct of the tests including apnoea testing and finally the BDD relatives consenting for organ donation. The anaesthesiologist should believe that caring for a BDD is akin to the athlete running the anchor leg of a gruelling race-the final transfer of the baton of life and in whose heart and spirit lies the ultimate responsibility of preserving the lead or in most cases making up lost ground. The anaesthesiologist as a leader also has a larger role to play by way of supporting various initiatives aimed at improving the community's perception towards organ donation.

THE PROBLEM LOAD OF END STAGE DISEASE

There are an estimated 2 million people in India suffering from heart failure, and most will succumb

early to the disease without medical optimisation or interventions including a heart transplant.^[1] The list of patients awaiting liver transplants as well as the number of end-stage renal disease patients kept alive on dialysis are testimony to the dismal rates of organ donation in our country.

The southern states in India have demonstrated great zeal in promoting organ donation yet most of India lags behind. It is vital that each organ pledged for transplant be valued as a national treasure. The government is working hard to set-up National and Regional transplant Coordination centres to improve the grim scenario. One of the initiatives is to certify Non-Transplant Organ Retrieval Centres (NTORC), smaller hospitals where organ retrieval (but not organ transplant) can be performed after the certification

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of brain death. This should lead to an increase in the number of BDD, and it would also require all anaesthesiologists to possess knowledge about brain death and organ harvesting.

HOW SHOULD THE ANAESTHESIOLOGIST LOOK AT THIS CHALLENGE?

It is with great trepidation that an unprepared anaesthesiologist answers the call for taking care of the brain-dead patient. While there are standard guidelines for management of the BDD,^[2] preparing for this role in the operation theatre needs more a preparation of the mind than any new skill acquisition. The process of organ harvesting, like any other high risk case can be remarkably smooth, but it is unfailingly rigorous and mentally draining. Caring for a BDD is equivalent to caring for six unstable patients and often relegated to the most junior member in the team. The anchor leg is always run by the best in the team and there is no one better than an experienced anaesthesiologist to guarantee success in this race for life. This analogy should never be lost on us as in this instance, the outcome of multiple recipients may hinge on crucial decisions taken or opportunities missed during the care of the BDD.

KEY POINTS

1. Organ donation allows the family of the BDD to find some solace in the fact that their loved one may continue to live in another. This emotion of helping another fellow being in their period of greatest grief should be supported unflinchingly. Significant variations exist in the protocols, infrastructure and resources, quality of patient care in hospitals across India. But what is uniform is a palpable sense of ownership and desire to help realise the wishes of the bereaved donor family
2. Every anaesthesiologist knows that even a 'minor' surgery carries a risk. The ultimate aim should therefore be to minimise the dependency on the living organ donor programme. Endangering a normal person to help a sick individual will no longer be required if adequate BDD organs become available
3. Excellent public support is absolutely essential for organ donation and transplantation to exist and flourish in any country. Anyone involved in this activity is closely observed by those around and it is vital that all times we display characteristics of a committed and humane physician
4. Anaesthesiologists may be called to assist in the management of a BDD. In addition, as per the amendments in the Transplantation of Human Organ Act 2011, when a neurologist or neurosurgeon is not available in a hospital, any physician including an anaesthesiologist (not part of the transplant team) nominated by the medical administrator in charge of the hospital, and approved by the appropriate state authority, can be the member of the board of medical experts for certification of brain death. This places additional responsibility on the anaesthesiologists to gain knowledge and get trained in understanding the current concepts and controversies in the certification of brainstem death including confounding factors, neurological examination, the apnoea test and ancillary tests as well as communication and documentation of these tests
5. A lot of new initiatives including educating at schools and colleges, obligatory mention on driving license about desire to donate (opt-in system) or the specific desire not to donate (opt-out system) need to be introduced. These will need the support of an evolved fraternity such as ours
6. Anaesthesiologists should at active every level be of organ donation system. The anaesthesiologist's perspective – one that of a keen yet detached care provider is quite unique. Ethical dilemmas exist but anaesthesiologists make excellent counsellors.

INTRAOPERATIVE MANAGEMENT OF BRAIN-DEAD ORGAN DONOR

A well prepared and willing anaesthesiologist will contribute immensely to the success of the organ transplant programme. Knowing which organs are going to be harvested helps in formulating a good strategy. A dysfunctional organ will affect the functioning and outcome of other salvageable donor organs.^[3]

1. Haemodynamic management – The rostro-caudal progression of brain injury from the midbrain to the brain stem and death usually results in severe hypertension due to catecholamine storm followed by persistent hypotension due to loss of sympathetic tone, vasoplegia, cardiac

dysfunction and multifactorial hypovolemia.^[4] Invasive monitoring lines – arterial line and a central venous catheter are mandatory and need to be secured early in the management. Most BDD may be on some inotrope such as dopamine or adrenaline and almost always on noradrenaline infusion to counter the vasoplegia. Significantly high doses of inotropes are a sign of a deteriorating condition and mandate urgency in proceeding. Even a brief disruption of these supports is poorly tolerated and hence battery enabled reliable syringe pumps and appropriately filled syringes for reloading should be available. Significant hypotension may occur when the major organs such as heart, liver and lung are handled, and a close watch is needed to ensure that these manipulations are limited. When the heart or the lung is one of the organs that need to be harvested, the involvement of the cardiac anaesthesiologist (often from the recipient team) early will ensure proper evaluation of the heart along with optimisation of the haemodynamics in the donor. Needless to say, this would also ensure adequate preservation of all the other organs as well

2. Pre-operative evaluation – Proper assessment of the BDD includes confirming the history including mode of death, comorbidities, addictions, radiological studies, blood investigations, culture reports and apnoea test arterial blood gases. A recent arterial blood gas analysis, hemogram and electrolytes are desirable. A thorough note should be made of donor family consent (Form 8) and the brain death certification (Form 10) on which the appropriate authorities signatures must be present
3. Monitoring and equipment – Standard monitoring including electrocardiography, oximetry, capnometry, invasive arterial and central venous pressure, temperature and urine output must be in place. At least, three suction machines are usually employed for the harvesting and a close watch kept for significant bleeding. Some cardiac units do a detailed pulmonary artery catheter-based evaluation for assessment and optimisation. A transesophageal echocardiography is preferred by most cardiac teams to evaluate the heart as well as volume status optimisation and ruling

out serious valvular and congenital problems. A defibrillator and appropriate internal paddles are needed to tackle significant arrhythmias. Ventilation and monitoring may be stopped after ensuring a cardiac standstill on infusion of the preservative solutions. Extubation should be done in the OR

4. Volume status – crystalloid is the choice of fluid for BDD.^[5] An adequate CVP of around 6–10 mm of Hg is usually targeted and an ECHO may guide preloading. Hypovolemia due to the trauma or more commonly diabetes insipidus (DI) is countered by vasopressin infusion which also helps in maintain the systemic vascular resistance along with getting the polyuria under control and also help to reduce the noradrenaline infusion rates. Renal function will depend on excellent optimisation of the volume status^[6]
5. Ventilatory status – If a lung harvest is planned, the BDD should receive protective lung ventilation consisting of smaller tidal volume (6 ml/kg/min), positive end-expiratory pressure (positive end-expiratory pressure of 4–8 cm of water) and a low FiO₂.^[4] Routine manoeuvres such as proper oral and endotracheal suction and recruitment strategies help in preserving the lung. Excess intravenous (i.v.) infusions and subsequent lung water are detrimental to the lung graft. Intermittent disconnection of ventilation to allow bronchoscopic suction and collection of cultures and to facilitate dissections around the heart and lung may be needed. The stomach filled with free water administered as DI management is emptied to prevent aspiration and facilitate dissection. A PaO₂/FiO₂ of more than 300 is desirable
6. Metabolic status – electrolyte imbalances such as hypokalaemia and low calcium and magnesium need continuous correction. Hypernatremia is detrimental for the organs especially the liver. Treatment in the form of vasopressin infusions and hypotonic solutions are continued and a modest urine output (more than 1 ml/kg) is targeted. Hypothermia may aggravate these deleterious effects and normothermia should be the target
7. Drugs and medicines – Vasopressors, potassium and insulin should be continued. A long-acting neuromuscular agent is administered before the incision to counter any movement due to

intact spinal reflexes, along with opioids and inhalational agents. Antibiotics should be given either empirically, or if available, directed by culture and sensitivity. An i.v. dose of 300 units/kg of heparin is administered at the end of the dissection a few minutes prior to the clamping and subsequent administration of the cold preservative solutions. Coagulopathy is common yet transfusions are avoided to reduce immunological responses and rejection risks. A 'hormone cocktail' of i.v. thyroxine, insulin, vasopressin and steroids is usually reserved for the BDD with borderline organ functions with a prolonged waiting period or requiring high inotropic supports

8. Special role – An excellent communication is mandatory to coordinate manoeuvres such as clamping of the limb vessels leading to loss of femoral arterial tracing, pulling out the central line is necessary before clamping the superior vena cava, ventilating the lungs with air and keeping them inflated (for a lung graft) before tracheal clamp. An anaesthesiologist, as master of the operation theatre is ideally suited to create a good rapport between the various harvest teams from diverse geographic areas. A simple round of introduction, confirming their respective roles and enumerating the operative steps and any special requirements (e.g., a request for delay in the clamp time due to issues in the transport arrangements for the heart team) go a long way in ensuring a working atmosphere where mutual cooperation among the surgical teams (usually unprecedented!) ensure that all organs are given equal importance. The heart (due to its shortest allowable ischemic time of under 4 hours) is a priority and the ultimate clamping time is based on the judgement of the cardiac team.

FUTURE DIRECTIONS AND CHALLENGES

Over the past years the number of organ transplants at high volume centres have plateaued owing to the limited number of eligible BDD. In the same period the number of patients on the waiting list have increased many fold. This led to the practice of accepting 'extended donor criteria' which meant, for instance that elder donors with sub-optimal organ functioning made the grade and the results were encouraging. Anaesthesiologists will have a bigger

role as 'marginal and high-risk BDD' will provide the biggest opportunity for increasing the donor pools.^[7] Donors resuscitated after a cardiac arrest will be a challenging subset and the initial evidence seems to be quite favourable for recipient outcome.^[8] Organ care systems, currently expensive will at a later stage provide a path-breaking alternative to enhance the survival of organs outside the donor and let the transplant team observe the functioning and recovery of a borderline organ.^[9] If withdrawal of life support finds legal acceptance in our country, donation after cardiac death will be another avenue for promoting organ donation, though a lot of ethical debate will ensue.^[10]

There is a need for introspection. We need to ask:

- a. Is there a need to improve our knowledge about brain death?
- b. Will we work towards spreading word about organ donation in the community?
- c. Will we register as proud organ donors and inform and inspire our family to do the same?
- d. Will we actively participate in the certifying as well as the management of brain-dead organ donors?

In the mythological Mahabharata, Yudhishtra answered correctly all the questions that the mystical Yaksha (who later revealed himself to be Yama-God of death) asked of him and gifted life to his brothers. An estimated five lakh people die every year in India due to end stage organ disease. It is upon us now to answer these questions and help win life for our dying brothers and sisters.

SUMMARY

A robust brain-dead organ donation programme is a reflection of a progressive and mature society. The anaesthesiologists will have a role not only in caring for the BDDs in the operation theatres but also in certain situations in the process of brain stem death certification. Various government initiatives and participation by a motivated community will lead to an increase in the numbers of brain-dead organ donors. A well prepared anaesthesiologist can ensure better preservation of the precious organs and their optimal functioning in the recipients.

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